Sheboygan River Post-Dredge Sediment Confirmation Sampling Sample Design and Further Action Decision Flowchart

Introduction

A post-dredge bathymetry survey followed by sediment confirmation sampling will be conducted after dredging has been completed to the target cutline within each Dredge Management Unit (DMU) to document post-dredge PCB and PAH sediment concentrations. A flow chart has been prepared to guide decision-making on whether further action is needed following dredging, based on the results of the sediment confirmation sampling. Potential actions consist of 1) no further action, or 2) redredging, followed by another bathymetry survey and confirmation sampling, and/or 3) placement of a residual management sand cover. The flow chart outlines a series of action levels that will dictate the above actions dependent on the PCB and PAH confirmation sample concentrations. A sampling design was developed for the post-dredging sediment confirmation sampling detailing the sampling approach, sequence of post dredge activities, number/placement of locations and the respective number of samples.

Determination of Confirmation Sample Locations

110 grid locations approximately 110 x 110 feet square will be implemented during confirmation sampling. Grids will be further sub-divided into 55 x 55 foot grid quarters for further delineation if the initial grid sample results exceed criteria. Additional shoreline sample locations will be collected to characterize the insitu concentration of sediments left in place. Shoreline locations will be placed at a 110 foot spacing along areas having a shoreline offset resulting in approximately 65 locations.

The grid and sub-grid size was determined by using the number of distinct locations (518) within the RI dataset used to perform the 3d geostatistical model divided by the project area (1,600,500 square feet). This results in each sample representing 3,090 square feet, or a 55 x 55 square grid. Due to the number of locations and samples needed to delineate 55 square foot grids the grid size was increase to 110 x 110 feet, with the implementation of sub grids (55 x 55 feet) at a greater density pending analytical results of the original grid.

Sequence of Post-Dredge Activities

In order to facilitate dredging production and decision-making for the site, dredge management units (DMUs) will be established based on an estimate of an area that can be dredged in a two-week schedule. Dredging will be conducted in three distinct areas of project identified as Area 1 (upstream of 14th Street), Area 2 (between 14th Street and Pennsylvania Avenue), and Area 3 (between Pennsylvania Avenue and 8th Street), each of which will contain between 3 to 8 DMUs.

At the conclusion of the initial dredging to specified design elevation in each DMU, a bathymetry survey will be conducted followed by sediment confirmation sampling. Subsequent further action will be driven by the total PCB result (see flowchart). If the observed PCB result is below the respective action level redredging will not be required and the result will be incorporated into a rolling SWAC calculation to determine placement of a residual management sand cover. If the total PCB result of the 0-0.5 foot interval exceeds 50 ppm , the predetermined 110 x 110 foot grid will be redredged to the bottom of the interval exceeding 50ppm. If the total PCB result of the 0.5-1.0 interval exceeds the action level of 10ppm, four predetermined 55 x 55 foot sub-grid location samples will be collected and analyzed to further delineate the original grid. If the average result of the original and sub-grid interval results are < the action level (10 ppm), no further dredging will occur and the averaged concentration will be used for sand cover placement decisions. If the average result is > 10 ppm, the 110 x 110 foot grid will be redredged to the bottom of the deepest interval exceeding criteria, resurveyed, and resampled. Redredging will only occur in areas where shoreline stability and offset requirement can be maintained. Upon completion of confirmation sampling and any necessary redredging, a bathymetric survey will be conducted to document final dredge elevation.

Dredging will proceed while post-dredge confirmation sample results are evaluated for each DMU as they are completed. In addition, PCB and PAH confirmation sample results from each DMU will be used in conjunction with

each consecutive DMU increasing the quantity of data used within the rolling SWAC average to determine sand cover placement.

Technical Approach

Vibracore techniques will be used to advance 2 and 4-foot sediment cores (depending on the DMU) and segmenting them into two 0.5 foot intervals for the first 1-foot of recovered sediment followed by 1 foot intervals beyond the first foot of recovered sediment. Locations upstream of the Pennsylvania Avenue bridge (Areas 1 and 2) will be collected to 2 feet, while locations downstream (Area 3) will be collected to 4 feet to account for the potential of greater sediment thickness. The upper 0.25 feet (3 inches) is considered to be representative of generated residuals from the dredging process with remaining sediments being representative of undisturbed native sediment. The 0.0-0.5 foot sample interval is assumed to represent a 1:1 ratio of dredge residuals and native sediment. PCB and PAH samples will be collected for each interval. PCB samples collected within the upper foot will be immediately analyzed, while any samples >1 foot will be archived and pending analysis. Decisions on further action will be made based on the total PCB concentrations from the first two intervals (0-0.5 and 0.5-1.0 feet), including analyzing any archived sample intervals for each core location. All PAH samples collected are to be initially archived until the final dredge surface has been established by the total PCB results and sand cover placement is to be determined.

Shoreline sample locations will be collected to refusal for total PCB and PAH and segmented into 2 sample intervals (0-2 feet and 2 feet to refusal depth) in order to characterize the insitu concentration of sediments left in place. Results of shoreline samples will not be used for re-dredge considerations.

The total PCB result will be the sum of detections for the four aroclors historically found at the site (1242, 1248, 1254, and 1260). Total PAH results will be represented by summing detect values of the 13 SVOC compounds analyzed for during RI activities (acenapthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene) using the standard analysis by method 8270.

Additional quality control samples will be collected at a frequency of 5% of the total sample number for the site for quality control purposes and to estimate variability due to sampling, sample handling, and analysis. These field replicate samples will be sampled at random, with each DMU containing at least one field replicate.

Table 1

Estimated Sample Locations and Samples per Location

Location Type	# of Locations	PCB Samples		PAH Samples		Assumptions
		Analyzed	Archived	Analyzed	Archived	
Areas 1 and 2 Grids (110 x 110 ft)	43	2	1	1	2	All PAH samples initially archived (3). Upon meeting PCB criteria 1 PAH sample from representative depth analyzed for SWAC calculation
Areas 1 and 2 Sub-grids (55 x 55 ft)	16	2	0	0	0	Assumed an original grid exceedance rate of 10%. 4 grids x 4 locs p/grid = 16 total
Area 3 Grids (110 x 110 ft)	42	2	3	1	4	All PAH samples initially archived (5). Upon meeting PCB criteria 1 PAH sample from representative depth analyzed for SWAC calculation
Area 3 Sub-grids (55 x 55 ft)	16	4	0	0	0	Assumed an original grid exceedance rate of 10%. 4 grids x 4 locs p/grid = 16 total
Shoreline	80	2	0	2	0	
TOTAL	**197**	**426**	**169**	**245**	**254**	